

# Corinex

## AV200 Powerline Ethernet Adapter



## User Guide

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# 1 Introduction

## 1.1 Overview

The *Corinex AV200 Powerline Adapter* is a network interface adapter which uses the electric power lines already in your home or office as a medium for communication. After successful installation, the AV200 Powerline network behaves like a traditional LAN for computers. The *Corinex AV200 Powerline Adapter* supports up to 200 Mbps network speed.

The advantage of our product is that it keeps network maintenance costs low and eliminates usage barriers, while requiring no additional wiring. It is highly integrated, and requires no external electronic components.

The *Corinex AV200 Powerline Adapter*:

- Enables users to connect individual PCs or other devices with Ethernet communications links into a local area network through existing electric power lines (Powerline)
- Enables PC file and application sharing
- Enables peripheral and printer sharing through the Powerline network
- Enables shared broadband Internet access
- Enables sharing of bandwidth for multimedia payloads, including voice, data, audio and video
- Eliminates the need for long network cables throughout your home or office
- A real, cost-effective, and reliable solution for high-speed communications in any home or small office

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## 1.2 About this Manual

This User Guide includes everything you need to know to help you successfully install the *Corinex AV200 Powerline Adapter* and meet your networking needs. With the information in this manual, you should be able to:

- Analyze your network efficiency
- Plan the configuration of your *Corinex AV200 Powerline Adapter*
- Install and configure your *Corinex AV200 Powerline Adapter* according to your plan
- Verify and optimize the performance of your *Corinex AV200 Powerline Adapter*

## 2 Installation Guide

### 2.1 What this Package Contains

When you receive your *Corinex AV200 Powerline Adapter*, check to be sure that your package contains:

- *Corinex AV200 Powerline Adapter*
- Power cable
- Straight-forward Ethernet cable
- Printed Quick Start Guide
- CD with documentation

We are constantly innovating our products. For the latest hardware/software changes, downloads, and additional information on your device, please visit [www.corinex.com](http://www.corinex.com).

We also advise you to visit our Corinex Authorized Powerline Partners Program web page <http://cappp.corinex.com/>, where you can find valuable information about complex applications and installations, as well as partners in your area who can provide installation services.

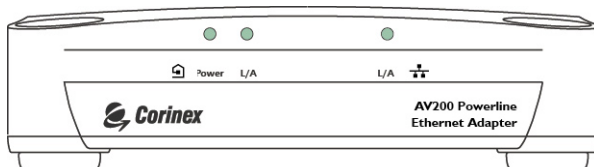
### 2.2 System Requirements

- IBM compatible PC or a Macintosh
- One available 10/100 Mbps Ethernet port
- Windows 98/ME/2000/NT/XP, Mac OS X or Linux operating system
- Javascript compatible web browser for configuration (Netscape, Internet Explorer, Opera...)

### 2.3 Front Panel Description

#### LED Definitions

(LEDs from left to right)

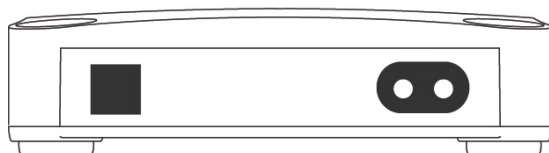


- |                    |       |   |
|--------------------|-------|---|
| <b>1. POWER</b>    | Green | On: Power on<br>Off: Power off  |
| <b>2. PLC</b>      | Green | On: Powerline activity<br>Off : No Powerline activity<br>Blinking : Receiving/Transmitting data |
| <b>3. ETHERNET</b> | Green | On: Link on LAN<br>Off: No link on LAN<br>Blinking: receiving/transmitting data                 |

## 2.4 Rear Panel Description

### Connector Definitions

(Connectors from left to right)



**1. LAN:** 1x RJ-45 LAN 10/100 Ethernet port

**2. Power cord:** Power supply & Powerline connector

<b>Standards Compliance</b>	IEEE 802.3u
<b>Speed</b>	Up to 200 Mbps on physical layer
<b>AC Plug Type</b>	US, EU, UK and AUS
<b>LED Status Lights</b>	Power, PLC Link/Activity, Ethernet Link
<b>Interface</b>	10/100BaseT Fast Ethernet, Powerline
<b>Frequency Range used</b>	2 – 34 MHz
<b>Power Input</b>	85 to 265 V AC, 50/60 Hz
<b>Dimensions</b>	148 mm L x 106 mm W x 47 mm H
<b>Transmitted Power spectral density</b>	-56 dBm/Hz
<b>Power Consumption</b>	5W
<b>Safety &amp; EMI</b>	UL/EN 60950, FCC Part 15, EN 55022 EMC limits



## 2.6 Installing the AV200 Powerline Adapter

To connect the *Corinex AV200 Powerline Adapter* to your computer, follow the steps listed below.

1. Connect the supplied Ethernet cable to the LAN port on the adapter and to an Ethernet port on your computer.
2. Connect the power cable to the Powerline port on the adapter and the other end into any AC electrical outlet.

**Note:** Please use a straight-forward Ethernet cable for connection of the AV200 Powerline Adapter to your computer. If you are connecting the AV200 Powerline Adapter to a modem or switch, please use a crossover cable.

## 2.7 Testing the Setup

To verify that your equipment is connected and working correctly, use the standard **Ping** utility. In Windows, click on menu **Start -> Run**, then write the command **ping IPADDRESS -t**, where IPADDRESS is the IP address of the computer to which the AV200 Powerline Adapter is connected, e.g. **ping 192.168.4.1 -t** (this process can be interrupted by pressing **CTRL+C**).

1. Ping the IP address of the computer to which the AV200 Powerline Adapter is connected. If this fails, there is a problem with the Ethernet network card or with the TCP/IP protocol.
2. Repeat the same process with the other computers on your AV200 Powerline network.
3. If all the computers can ping themselves, try pinging another computer on your AV200 Powerline network. If this fails, then there is a problem with the connection across your AV200 Powerline network or with the configuration of the AV200 Powerline Adapters. Check the connection to the outlet, or try a different outlet. Verify the configuration of the AV200 Powerline Adapters, especially the network number, as only adapters in the same network can see each other. Please see chapter 3 for details on configuration.

If you experience any problems with your setup, try unplugging the AV200 Powerline Adapter and restarting the computer, as this sometimes fixes the problem. If the problem persists, please refer to the troubleshooting guide at the end of this manual.

## 3 Web Configuration

In order to access the web configuration pages, it is necessary to know the adapter's IP address and to be connected to it (e.g. through an Ethernet cable). Adapters that have not previously been configured have the IP address [10.10.1.69](http://10.10.1.69). Open a web browser (Microsoft Internet Explorer v6.0, Mozilla v1.7.2 and Mozilla Firefox v1.0 have been verified for use with these products.), and type the IP address in the address bar – the URL should be <http://10.10.1.69/> unless you are not setting it up for the first time, and you have previously changed it to something else.

Changing the default IP address, [10.10.1.69](http://10.10.1.69), is required to allow access to an adapter when two or more units are active on the same network. The IP address is a device's unique identifier on a network, so the adapters would not be able to tell each other apart if they had the same identity, just as a postman wouldn't know which house to deliver to, if two neighbors in a large city had the same street number. Follow the steps below to configure a new IP address for each adapter:

1. In your computer's network settings, enter an address in the range 10.10.X.X and the netmask 255.255.0.0. This is necessary in order to be compatible with the adapter's default settings. For details on how to set up an IP address in your computer, please see chapter 5.
2. Plug in your AV200 Powerline Adapter and connect it to the PC via supplied Ethernet cable.
3. Open the Web browser and type the following URL: <http://10.10.1.69>. You will get to the configuration web interface of the AV200 Powerline Adapter.

### 3.1 Authentication Page

If the configuration password is enabled, you'll need to login before you can access the web pages where you make changes to the network. Therefore, you will first be taken to an **Authentication** page, where you will need to enter either the configuration password – to access these web pages or a factory reset password – in order to set the configuration to a default value. The embedded web server has an authentication timeout of 5 minutes; i.e. if no web pages are loaded within 5 minutes, the login expires and you will need to login again.

**Note:** The default password for accessing the configuration is “**paterna**”. The default password for resetting the adapter into default settings is “**betera**”.

**Corinex AV200 Powerline Ethernet Adapter Web Configuration**

**Authentication**

This unit is password protected. Please enter the correct password to access the web pages

•Password

Ok Cancel

Factory Reset\*:

•Password

\*Warning! Current configuration will be lost

Ok Cancel

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**Note:** If password protection is disabled, you will be taken straight to the **Main** page instead of the Authentication page.

## 3.2 Main Page

This is the first page you will see after logging in, or simply the first page, if the configuration password is disabled. It shows basic status information about the adapter, available Powerline connections, MAC and IP addresses, MAC type, etc.

**Corinex AV200 Powerline Ethernet Adapter Web Configuration**

**Available Connections**

PLC Connections:

PLC Port	MAC Address	Phy Tx Throughput	Phy Rx Throughput	Bridge State	Network Id
9	0008C20000CE	174 Mbps	169 Mbps	Forwarding	

External Interfaces:

Interface	Phy Throughput	Bridge State
Empty list		

Further information

Change configuration

**General Information**

MAC Type	In-Home AV / Node Type	EP
MAC Address	0008C20000CD	
IP Address	10.10.1.70	Number of Boots
SYNC	Done / MODE	13
AGC RX	Enabled / RXG	0
AGC TX	Disabled / TXG	1
Access Protocol	DONE	

Further information

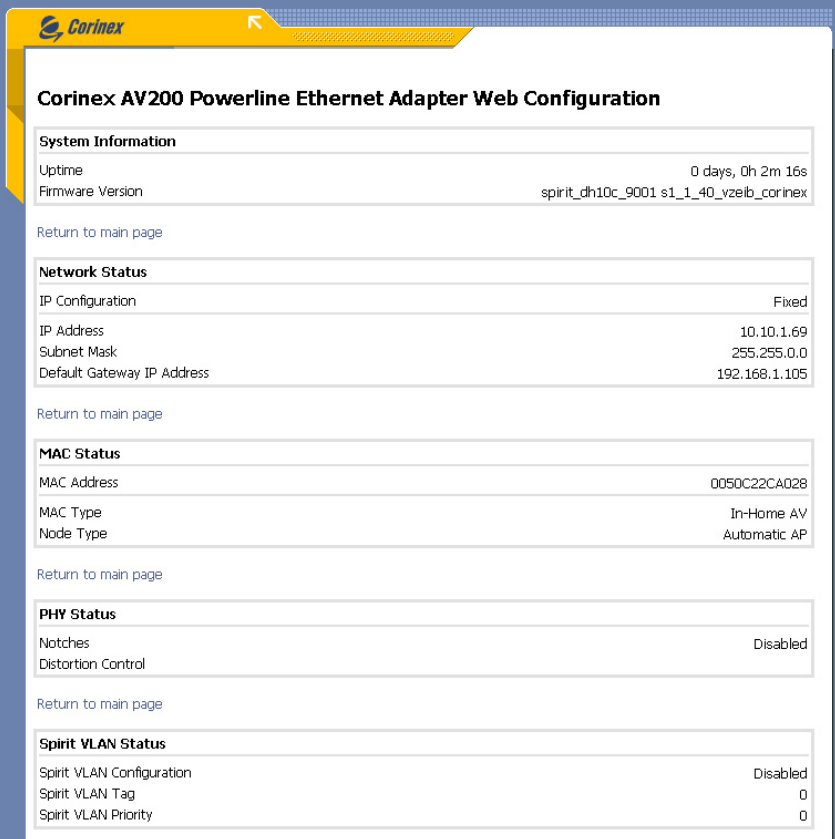
Change configuration

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Selecting **Further information** will load the Further Information page (see section 3.3). Selecting **Change configuration** will load the Change Configuration page (see section 3.4).

### 3.3 Further Information Page

This page shows more detailed information about the modem, such as the uptime, firmware version or detailed information about the settings of the modem.



**Corinex AV200 Powerline Ethernet Adapter Web Configuration**

**System Information**

Uptime	0 days, 0h 2m 16s
Firmware Version	spirit_dh10c_9001 s1_1_40_vzeib_corinex

[Return to main page](#)

**Network Status**

IP Configuration	Fixed
IP Address	10.10.1.69
Subnet Mask	255.255.0.0
Default Gateway IP Address	192.168.1.105

[Return to main page](#)

**MAC Status**

MAC Address	0050C22CA028
MAC Type	In-Home AV
Node Type	Automatic AP

[Return to main page](#)

**PHY Status**

Notches	Disabled
Distortion Control	

[Return to main page](#)

**Spirit VLAN Status**

Spirit VLAN Configuration	Disabled
Spirit VLAN Tag	0
Spirit VLAN Priority	0

You can return to the main page by clicking at **Return to main page**.

## 3.4 Change Configuration Page

### 3.4.1 Overview

The configuration page allows you to change some basic parameters on the adapter. Any parameter changed here will be stored in the adapter's permanent memory, and loaded and configured automatically after the next system boot. Any changes will take effect immediately after bootup, with the exception of Network Configuration settings (these require a reset of the adapter).

**Corinex AV200 Powerline Ethernet Adapter Web Configuration**

**MAC Configuration**

•MAC Type: In-Home AV [Ok] [Cancel]

In-Home AV Configuration:

•Node Type: EP [Ok] [Cancel]

•Network Identifier: [Text Field]

•Encryption Key: [Text Field] [Ok] [Cancel]

[Return to main page](#)

**Network Configuration\***

•IP Configuration: Fixed [Ok] [Cancel]

Fixed IP Configuration:

•IP Address: 10.10.1.69

•Subnet Mask: 255.255.0.0

•Default Gateway IP Address: 192.168.1.105

\*All changes in Network Configuration will have effect after system boot [Ok] [Cancel]

#### Notes:

- A different IP must be set for each adapter within a single network. An adapter's IP does not need to be in the same range as the PCs communicating with the adapters. But to access the configuration page, a PC must have the same address range as the adapter (10.10.X.X and netmask 255.255.0.0 in the default state).
- The adapter's netmask can also be changed, for example to a type C (255.255.255.0) if necessary. This is a more advanced option, which you may ignore if you're not familiar with it.

- If the adapter will be accessed through a router (for example in a large office network), the gateway IP needs to be configured. Otherwise, it can be ignored.

CHANGING AN ADAPTER'S IP TAKES EFFECT ONLY AFTER A RESTART OR REBOOT. YOU MAY WANT TO PLACE A LABEL ON EACH ADAPTER WITH ITS IP ADDRESS, SO YOU DON'T LOSE THE ABILITY TO ACCESS IT.



**If you change the IP Address and forget it, there is no way to reset it to default. This may imply sending the unit to Corinex for reprogramming.**

### 3.4.2 MAC Configuration

The following parameters relate to the network topology. The current firmware version (Spirit 1.2.1 at the time of this publication) supports only one topology: In-Home AV. In this In-Home AV topology, two different node types can be configured, so that a node can be either an Automatic EP/AP (End Point or Access Point, depending on the other nodes in the network) or a Fixed AP (configured Access Point). Section 4 (In-Home AV Network Topology) contains more information about the available network topologies.

MAC Configuration

•MAC Type

In-Home AV

Ok

Cancel

In-Home AV Configuration:

•Node Type

EP

Ok

Cancel

•Network Identifier

•Encryption Key

Ok

Cancel

If you want to configure the adapter to act as an automatic EP/AP, please select **EP** from the list. If you want the adapter to behave as a master, select **Fixed AP** from the list. In either case, click **OK** to confirm your selection.

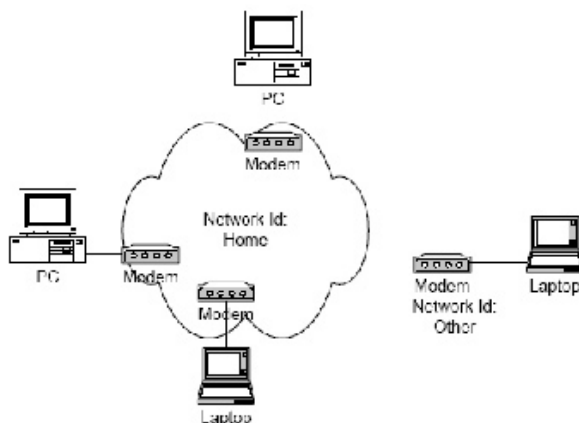
**Note:** Fixed AP is available only when the adapter is configured with a non-empty Network Identifier (please read below for details on Network Identifiers).

The AV200 technology supports multiple networks on a single electrical circuit. The networks are differentiated by Network Identifiers, which can be set in the MAC section. The Network Identifier is a character string (Network Identifier field) which simply acts as a name for the network. It must be the same value for all adapters on the same network. Adapters with different Network Identifiers are not able to communicate with each other.

**Note:** Please refer to section 4.2 for more information about the network types and their Network Identifiers.

In case of a null string (i.e. the Network Identifier field left blank), the default publicly available network is configured, and the adapter can communicate with any other adapter which also has a blank Network Identifier field. Otherwise, a private network is configured.

The following picture shows an example of two AV200 networks with different Network Identifiers.



Data transmission between adapters (modems, in the picture) is encrypted with a Triple-DES algorithm. The Encryption Key can be configured from a character string (Encryption Key field), which is actually a passphrase. The three 56-bit keys for Triple-DES encryption are obtained from this passphrase by means of a hash function. Entering a null string (leaving it blank) disables the encryption. After entering a passphrase, click **OK** to confirm your choice.

**Note:** The encryption will be enabled only if a non-empty Network Identifier is set.

### 3.4.3 Network Configuration

Your *Corinex AV200 Powerline Adapter* can be configured to use either DHCP (automatic IP address assignment), or a fixed IP.

The following parameters are used by the fixed IP configuration. In order to use the adapter in conjunction with other equipment within an In-Home AV network, it is necessary to define a valid and unique IP address in the network, as well as a proper subnet mask and gateway address. These parameters will be stored in the adapter and implemented following the next system boot.

**Network Configuration\***

•IP Configuration Fixed ▼

Fixed IP Configuration:

•IP Address

•Subnet Mask

•Default Gateway IP Address

\*All changes in Network Configuration will have effect after system boot

After changing any of these parameters, click **OK** to save your changes.

**Note:** Any change in the Network Settings requires a subsequent reboot of the adapter.

### 3.4.4 PHY Configuration

By default, the adapters transmit using a frequency anywhere from 2 to 32 MHz, and when an access network is detected, the adapters transmit using a frequency from 13.3 to 33.3 MHz, in order to operate without interfering with each other. This mode change is done automatically and cannot be configured by the user. It is only possible to enable or disable this „notches“ function. The notches pre-defined in the adapter correspond to the IARU band plan for each world region. If the adapter is running in an environment where it can cause interference to a HAM radio receiver, it is recommended to enable notches, in order to block the Powerline signal from the frequency bands used by HAM radio.

**PHY Configuration**

•Notches Disabled ▼



### 3.4.5 Multicast Configuration

In order to optimize multicast traffic (video streams, etc.) between AV200 Powerline adapters, you can specify which adapters you want to receive the traffic. Others will then not be able to receive the multicast communication, and therefore the bandwidth will be used only for transmission to the intended recipients, making your broadcast, and overall network, more efficient.

This form shows the list of multicast bindings, where multicast IP addresses are assigned to a unicast (stream source) MAC address. This list can be saved to the adapter (**Save in NVRAM**). Moreover, you can remove bindings by checking their **Remove** checkboxes and clicking **OK**. Add a new binding to the list by entering the multicast IP address, in decimal (ddd.ddd.ddd.ddd) format, and the unicast MAC address, in hexadecimal (XXXXXXXXXXXX) format, in the appropriate fields, and clicking **OK**.

**Multicast Configuration**

Multicast Bindings: Save in NVRAM

Multicast IP Address	Unicast MAC Address	Remove
<i>Empty list</i>		

New Binding:

- Multicast IP Address
- Unicast MAC Address (hex)

Ok Cancel

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### 3.4.6 VLAN Configuration

When AV200 Powerline adapters are used for ADSL extension, it is important for the operator to be able to distinguish the type of traffic that each adapter is generating. This is usually done by means of VLAN tagging. The AV200 technology includes the ability to tag all traffic that enters the Powerline network through each adapter's Ethernet interface. It is only tagging - there is no VLAN filtering on an AV200 Powerline network.

The parameters for VLAN configuration can be set in the form displayed below. First the Spirit VLAN can be enabled or disabled (*Spirit VLAN Configuration* select box). If enabled, the VLAN tag (*Spirit VLAN Tag* field) and priority (*Spirit VLAN Priority* field) can then also be configured.

**VLAN Configuration**

- VLAN Configuration Disabled
- VLAN Tag (2, 3, ... 4094)
- VLAN Priority

Ok Cancel

### 3.4.7 Priority Configuration

Several options are available in this form. The first, and easiest to understand and use, is the Default Priority value. Output traffic generated by adapters with higher default priority will have preference in the network. The rest of the parameters let you configure two Class of Service criteria (**Criterion 1** and **Criterion 2** select boxes).

If you select **None**, **8021p** or **TOS**, custom parameters are hidden, leaving a pre-defined setting in place.

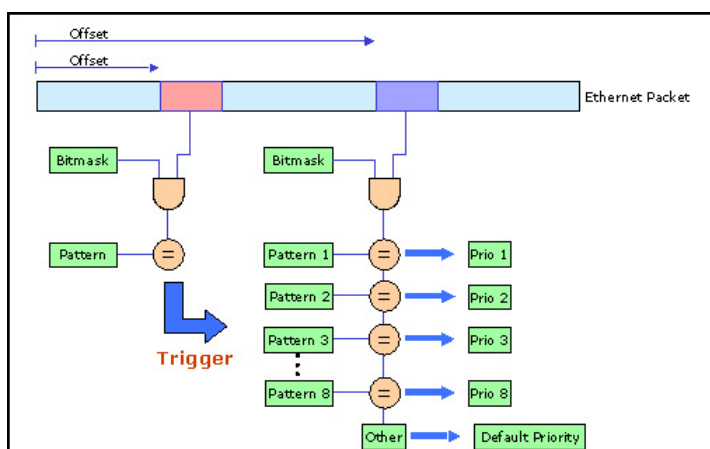
The screenshot shows the 'Priority Configuration' dialog box. It has three sections: 'Default Priority' with a dropdown set to '2', 'Criterion 1' with a dropdown set to 'None', and 'Criterion 2' with a dropdown set to 'None'. Each section has 'Ok' and 'Cancel' buttons.

If you select **Custom** on the other hand, custom parameters are shown as below and can then be configured.

The screenshot shows the 'Priority Configuration' dialog box with 'Criterion 1' and 'Criterion 2' set to 'Custom'. The 'Custom Criterion 1 Configuration' section includes fields for 'Offset' (0), 'Mask' (0000000000000000), 'Class Offset' (0), 'Class Mask' (0000000000000000), and 'Class Priority' (2). The 'Custom Criterion 2 Configuration' section includes fields for 'Offset' (0), 'Mask' (0000000000000000), and 'Class Priority' (2). The 'Class Priority' dropdowns are set to '2'.

When several traffic flows are sharing the same network, you sometimes need to establish several levels of priority to guarantee that bandwidth-sensitive applications such as video or telephony continue to work smoothly under network congestion.

The traffic classifier is a packet inspector that is able to recognize several patterns in an Ethernet frame, and assign a different priority to each of them. To ensure that the classification is done correctly, there is a trigger mechanism before the actual classification. The trigger mechanism is also based on pattern recognition of a given location in each Ethernet packet. The following picture depicts the packet classification mechanism.



There is one offset, one bitmask and pattern for the trigger condition. The trigger condition is used to make sure that the Ethernet frame contains, for example, an IP frame. To check this condition, the offset would need to be set to 16 and the bitmask to 0xFFFF. If the resulting pattern is 0x0800, then the Ethernet frame contains an IP packet and the classification can be made to a known field.

There is another offset and bitmask for the classification condition. The resulting value is compared with a set of patterns. If the value matches a given pattern, the packet will be classified with the specified priority. If the value does not match any of the patterns, it will get a default priority.

There is a set of pre-defined criteria that allow classifying traffic based on the **802.1p** field of the Ethernet packet or the **TOS** field of the IP packet.

### 3.4.8 Security Configuration

The web application allows you to change the configuration password by typing a new one in the specified fields (You must confirm your password by re-typing it in the second field). If both fields are left empty, the configuration password will be disabled (the message 'No password installed' will be shown in the security configuration form). Consequently, the web configuration authentication will be disabled too. The authentication can be enabled again by setting a password.

If you want to restore the adapter's default settings, you can invoke a factory reset. In order to do this, you have to enter the password „**betera**“ in the appropriate field and click **OK**. The adapter will reboot with the following configuration:

- IP address = 10.10.1.69
- Configuration interface password = paterna
- Factory reset password = betera
- Device type is Automatic EP/AP
- Network Identifier is blank
- No encryption and no VLAN settings

### 3.4.9 Hardware Reset

Clicking on this button will reset (or reboot) your adapter. The configuration will remain the same, and any changes made in the Network Configuration section will be applied. This means that if you've changed the IP address, the adapter will reboot with that new address.

Hardware Reset

Hardware Reset

### 3.4.10 Flash Upgrade

The firmware, the loader and the factory settings (default factory configuration) are stored in Flash memory. To upgrade them, first select the **Flash section** to update (**Firmware, Loader** or **Factory Settings**) and the protocol (FTP or TFTP). Then type the IP address of the **FTP** or **TFTP** server (**Server IP Address** field). In the case of FTP, type the user name (**FTP User**) and password (**FTP Password**). Then, whether using FTP or TFTP, type the file name of the firmware disk image (**File Name**). And finally, press **OK**.



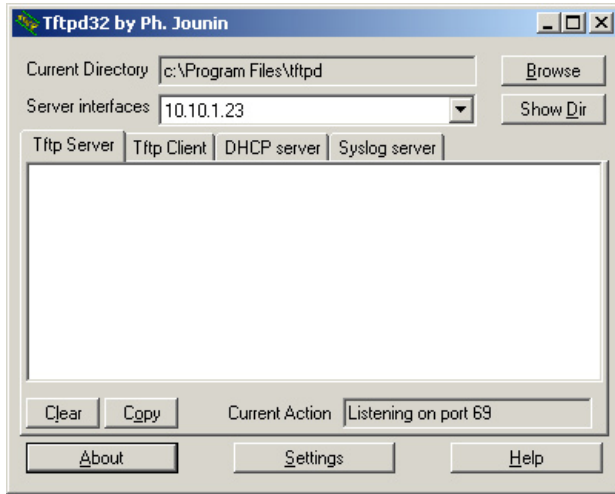
The image shows a 'Flash Upgrade' dialog box. It has a title bar 'Flash Upgrade'. Inside, there's a 'Status' label on the left and 'Ready: initial status' on the right. Below 'Status' is a list of items: 'Flash Section', 'Upgrade Protocol', 'Server IP Address', 'FTP User', 'FTP Password', and 'Filename'. To the right of these items are input fields. For 'Flash Section', there's a dropdown menu currently showing 'Firmware'. For 'Upgrade Protocol', there's a dropdown menu currently showing 'FTP'. Below these are four empty text input fields corresponding to 'Server IP Address', 'FTP User', 'FTP Password', and 'Filename'. At the bottom right are 'Ok' and 'Cancel' buttons.

### 3.4.11 Firmware upgrade using a TFTP Server

To upgrade the firmware of the modem using TFTP, a TFTP server must be running on a computer. We recommend a freeware tool called **TFTPD32**. This tool can be downloaded at the following address: <http://tftpd32.jounin.net/>. The firmware image is provided by Corinex.

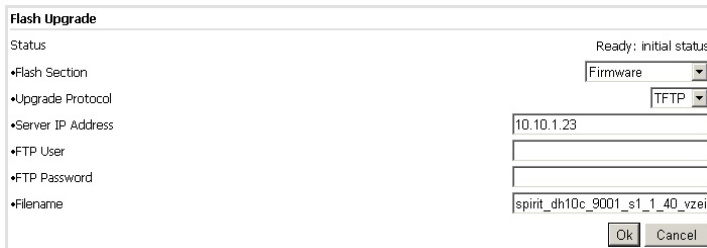
Follow the steps below to upgrade the firmware of a modem:

- I. Execute **TFTPD32**. This application has the GUI shown in the picture below



2. Place the image file in the directory specified in **Current Directory** or change it to point to the place where the image is stored.
3. Open the Web browser and enter the IP of the modem that to be upgraded.
4. When the page comes up, click on **Change configuration**.
5. In the **Firmware Update** window, select TFTP and enter the IP of the TFTP server and the name of the image file, as shown in the next picture.

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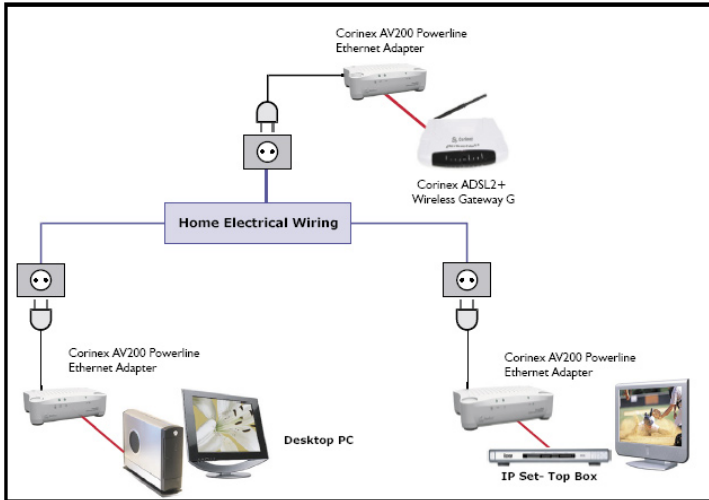


6. Click **OK** to start the process. Progress information is shown on the Web page every 30 seconds.
7. The modem will first download the file and then calculate the CRC.
8. If the CRC is correct, the **Hardware Reset** button will be highlighted. The modem must be reset for the new firmware to start running.

### 3.4.12 Configuring Video Applications

In the case of a network where real-time traffic must coexist with massive data transfers, the service classifier must be used to prioritize the bandwidth-sensitive traffic above the other types of traffic.

As an example, consider the network shown below.



The node connected to the ADSL modem is the access point. Data and video are delivered through ADSL. The access point has to prioritize UDP video over data to avoid a jittery image when there is a heavy data download.

First of all, the **Criterion** field must be set to **Custom**, in order to create one's own rules to classify the traffic.

To prioritize UDP traffic, first the Ethernet packets containing IP packets have to be detected. This requires detecting the pattern 0x0800 at offset 16. Because the field to inspect is two bytes, the bitmask must also cover the same space. Therefore, 0xFFFF is used as bitmask. These values are introduced in the fields **Custom Criterion Offset**, **Custom Criterion Pattern** and **Custom Criterion Bitmask**.

Once the trigger condition is entered, the classification rules must be specified. Only the fields that are actually changed will take effect. The rest will be ignored. IP packets have a one-byte field at offset 27 that indicates the Protocol Type. UDP protocol is pattern 0x11. Because the field to inspect is only one byte, the bitmask is also one byte. The values are entered in the first available rule (1) as **Class Pattern 1** and **Class Priority 1**.

The rest of the traffic (FTP, Web browsing, etc.) will receive default priority 2. On the other side of the network, the modem connected to the computer will also classify outgoing data traffic with default priority 2 because no rule has been programmed.

**Note:** While the offset value is assumed to be decimal, the patterns and the bitmasks are in hexadecimal format by default.

### 3.5 Firmware Update Page

This page appears when a firmware update is requested from the **Change Configuration** page, and it shows the status of the current firmware update. The **Firmware Update** page is reloaded automatically every 30 seconds. When the status line shows **Ready: finished correctly**, the adapter can be restarted, and the new firmware will be loaded.

If the update process fails, an error message will be shown. In this situation, the adapter can be reset without any risk, but the old firmware will still be present on the adapter.



## 4 In-Home AV Network Topology

### 4.1 Introduction

An *In-Home AV* network is made of an access point (AP) node and several end points (EPs). One and only one access point (AP) can be in an In-Home AV network. However, it is possible that more than one In-Home AV network can coexist together, each of them with its own AP, because each of them is isolated from the others by means of a different network identifier. A modem can be configured as a Fixed AP (i.e. it always will be an AP) or an automatic EP/AP. In case of automatic configuration, the In-Home AV protocol will decide dynamically if the node becomes an EP or an AP. It means, that in a network where no Access Point (AP) has been defined, at least one of the End Points (EPs) will redefine itself as an automatic AP.

**Note:** It is not necessary to have full connectivity between all of the nodes in one network. The network topology will be configured automatically, allowing for the use of repeaters if the connectivity between two nodes falters.

The necessary steps to set a basic In-Home AV network are, for each node, as follows:

- Set its **IP address**. It should be a unique **IP** address (e.g. private address like 10.10.1.<last MAC address byte>).
- Select the spectral configuration (**notches** enabled or disabled).
- Set the **Network Identifier**. It should be the same value for all nodes in the network.
- Configure the **Encryption Key**. It should also be the same value for all nodes in the network.
- It is not necessary to configure the **In-Home AV MAC**, since there is only one available network topology in current firmware version. To configure a **Fixed AP** is optional.

### 4.2 Network Scenarios

In this section the user is presented with a few network scenarios, explaining the application and necessary configuration.

There are two types of an In-Home AV network.

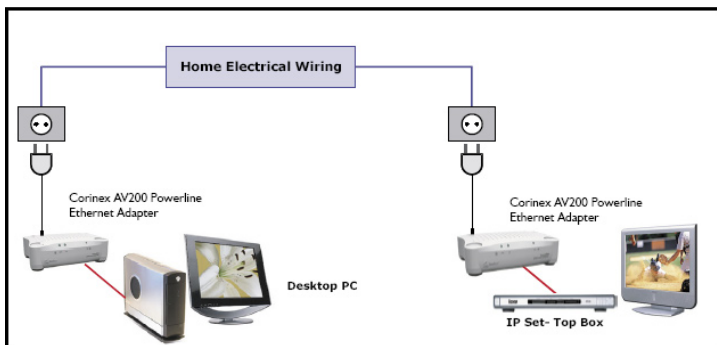
- **Public Network** - This is the default configuration of an In-Home network. If the user does not want to configure its network, the network configuration protocol will configure all nodes automatically. By default, all nodes are EPs and have a public network ID. If the protocol does not detect an AP in the channel, it will select an EP as automatic AP. All EPs will connect directly to the automatic AP if they have direct visibility, or to an EP that will act as a repeater. Then the network will be established.
- **Private Network** - To configure a private network (to ensure data privacy), a network ID must be assigned to all nodes of the network using the configuration tool. It is recommended to configure a node as a fixed AP (for example the node with the video server or Internet access). If the fixed AP is turned off or it is not defined by the user, the network configuration protocol will select an EP to be transformed into an AP (automatic) to configure the network.

### 4.2.1 Single-Network Scenarios

The following two sections show examples of a single In-Home AV network.

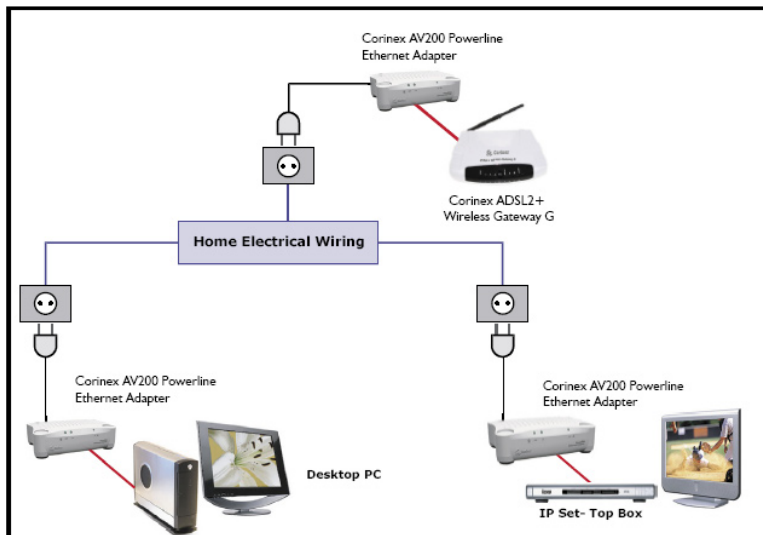
#### 4.2.1.1 Local Area Network using two AV200 powerline adapters

The picture below shows a simple PLC (Powerline) network where two adapters are used to make a local area connection available in all outlets of the house. This is the simplest case, where no QoS (Quality of Service) configuration is required.



#### 4.2.1.2 Extending the internet connection to an AV200 powerline network

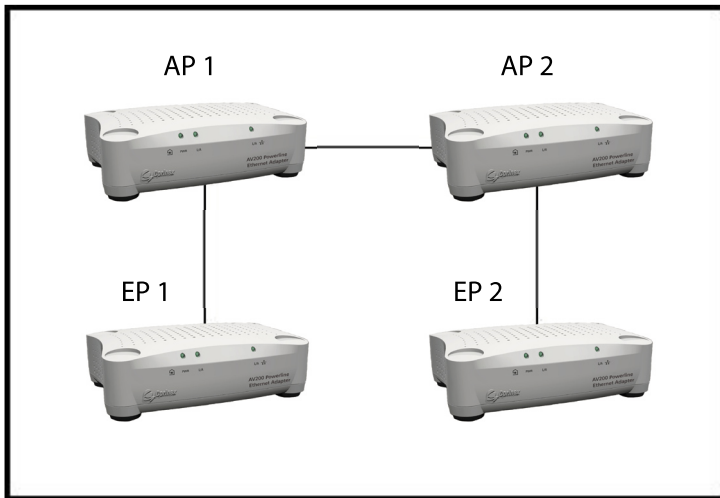
The next picture shows a more advanced PLC (Powerline) network with three *Corinex AV200 Powerline Adapters*. This is a common network configuration, where Internet access and digital video are delivered through the same ADSL line. This configuration requires some QoS (Quality of Service) settings to guarantee video quality when the network is carrying large amounts of data from the Internet connection.



**Note:** Any of these two basic scenarios can be enlarged, adding more adapters, computers and set-top boxes.

#### 4.2.2 Multi-Network Scenarios

A multi-network scenario occurs whenever there are two or more nodes from different In-Home AV networks (different network IDs) that have direct visibility. In this case, a coexistence mechanism that allows a secure form of communication without interference from nodes from different networks is included.



In multi-network scenarios, such as the one depicted in the picture above, there is a new entity, called the QoS controller. The QoS controller's role is to assign channel access to the different networks. The QoS controller acts at the same time as the AP of one of the networks. In the presence of several In-Home networks, the coexistence protocol automatically selects one of the APs as the QoS controller.

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## 4.2.2.1 Two networks with no visibility

If two In-Home AV networks are configured, with no direct visibility between any of the nodes belonging to different networks, then these two networks will behave as two independent networks. Both APs will act as QoS controllers.

## 4.2.2.2 Two networks with direct visibility

Different networks are defined by different network IDs.

If two In-Home AV networks are configured as public networks, the coexistence protocol will act as if there were only one network. The network ID is transmitted by every node to communicate the existence of its network. If a node with a network ID A receives a network ID B, then it knows that there are at least two networks sharing the channel.

For example, one In-Home AV network is configured and running. A second network is configured and starts working after the first network is configured. Then the second network will notify its presence to the first network in some specified access slots, and both networks will automatically be reconfigured and will share the channel. If both networks are configured at the same time, the QoS controller will be selected from all of the present APs.

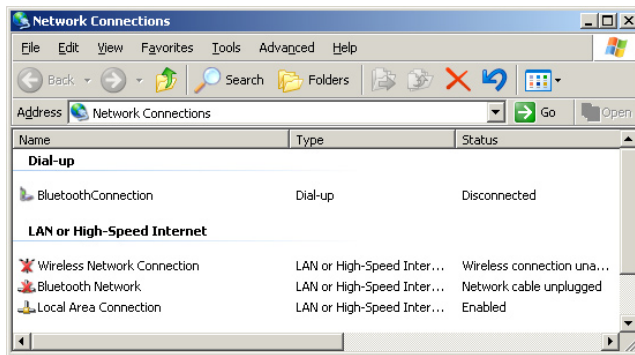
## 5 Network Configuration

### 5.1 Setting an IP Address in your computer

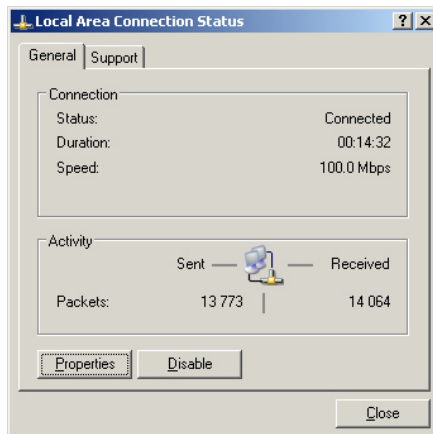
This section explains how to set a static IP in your computer's operating system, in order to connect to the *AV200 Powerline Adapter* and configure it.

#### 5.1.1 Setting up a static IP in Windows XP

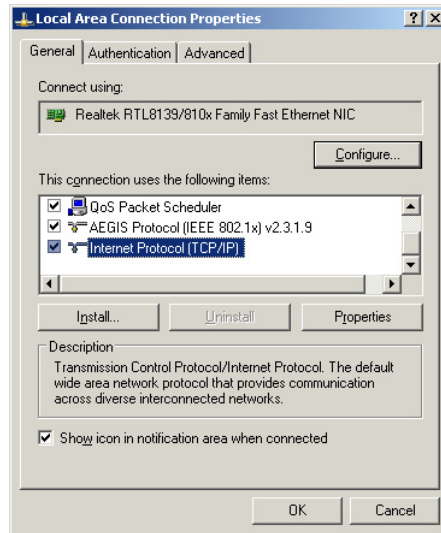
1. Click the **Start** button, open the **Control Panel**. From there, click the **Network Connections** icon and then the **Network Connections** window appears.



2. Select the **Local Area Connection** icon for the applicable adapter (Ethernet adapter or Powerline - usually the first adapter listed). Double-click the **Local Area Connection**.
3. The **Local Area Connection Status** screen will appear. Click the **Properties** button.

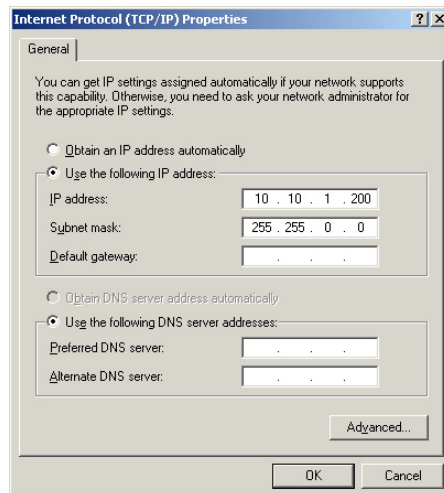


4. Select **Internet Protocol (TCP/IP)** and click the **Properties** button.



5. Select **Use the following IP address**. Set the **IP address** manually in the format 10.10.1.X (for example 10.10.1.200) and mask 255.255.0.0 of local TCP/IP settings. The **Default gateway** box can be empty.

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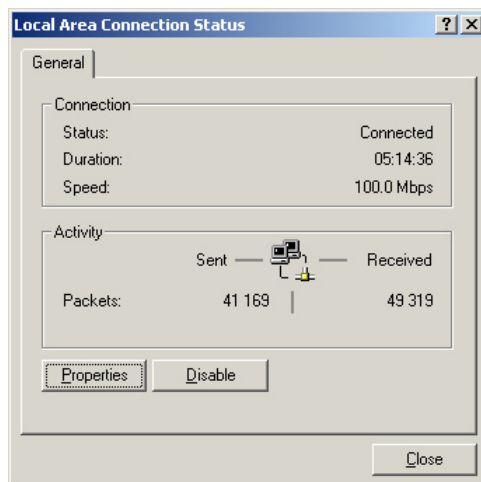
- Click **OK** button in the TCP/IP Properties window to complete the PC configuration, and click **Close** or the **OK** button to close the Network window.

## 5.1.2 Setting up a static IP in Windows 2000

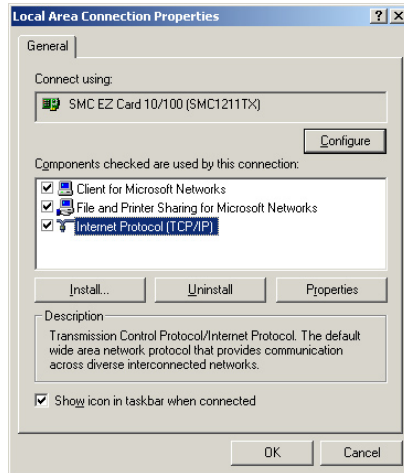
- Go to the **network** screen by clicking the **Start** button. Click **Settings** and then **Control Panel**. From there, double-click the **Network** and **Dial-up Connections** icon.



- Select the **Network and Dial-up Connections** icon for the applicable Ethernet adapter (usually it is the first Local Area Connection listed). Do not choose a TCP/IP entry which name mentions DUN, PPPoE, VPN, or AOL. Double click the **Local Area Connection**. The following window will appear.

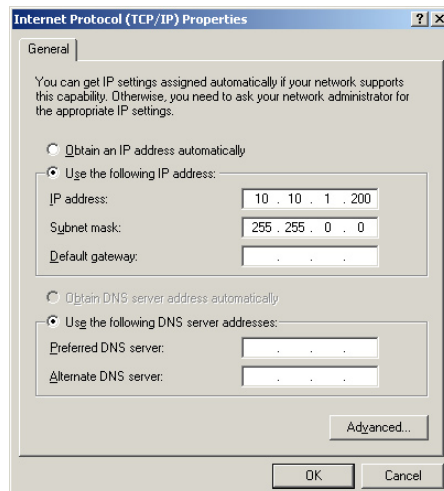


- Click the **Properties** button to get to the Local Area Connection Properties.



- Select **Internet Protocol (TCP/IP)** and click the **Properties** button.
- Select **Use the following IP address**. Set the **IP address** manually in the format 10.10.1.X (for example 10.10.1.200) and mask 255.255.0.0 of local TCP/IP settings. The **Default gateway** box can be empty.

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- Click **OK** button in the TCP/IP Properties window to complete the PC configuration, and click **Close** or the **OK** button to close the Network window.

## 5.1.3 Setting up a static IP in Windows 98

- Go to the **network** screen by clicking the **Start** button. Click **Settings** and then **Control Panel**. From there, double-click the **Network** icon.
- On the **Configuration tab**, select the **TCP/IP** line for the applicable Ethernet adapter. Do not choose a TCP/IP entry that mention DUN, PPPoE, VPN, or AOL names. If the word TCP/IP appears by itself, select this line. If there is no TCP/IP line listed, please refer to your Ethernet Adapter's User Guide on how to install TCP/IP protocol. Click the **Properties** button.
- If you do not have DHCP server on the network, then select **Use the following IP address**. Set the **IP address** manually in the format 10.10.1.X (e.g. 10.10.1.200) and mask 255.255.0.0 of local TCP/IP settings and click the **OK button**.
- Click the **OK** button again. Windows may ask you for the original Windows installation disk or additional files. Supply them by pointing to the correct file location, e.g., D:\win98, D:\win9x, c:\windows\options\cabs, etc. (if "D" is the letter of your CD-ROM drive).
- Windows may ask you to restart your PC. Click the **Yes** button. If Windows does not ask you to restart, restart your computer anyway.

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## 5.1.4 Setting up a static IP in Linux

- You have to be logged in as *root* in order to change the IP address in your Linux system.
- Enter the console if you are using some graphical user interface (KDE, Gnome).
- To change the IP address to 10.10.1.200, enter the command:

**ifconfig eth0 inet 10.10.1.200 netmask 255.255.0.0 up**

and press **Enter**. The previous command take eth0 as the name of the Ethernet interface and may be different on your system. You can check the status of all network interfaces by executing the command **ifconfig** on the console.

```

root@pepcok:~# ifconfig eth0 inet 10.10.1.200 netmask 255.255.0.0 up
root@pepcok:~# ifconfig
eth0      Link encap:Ethernet  HWaddr 00:A0:D1:DD:3B:51
          inet addr:10.10.1.200  Bcast:10.255.255.255  Mask:255.255.0.0
          inet6 addr: fe80::2a0:d1ff:fedd:3b51/64 Scope:Link
          UP BROADCAST RUNNING MULTICAST  MTU:1500  Metric:1
          RX packets:55  errors:0  dropped:0  overruns:0  frame:0
          TX packets:19  errors:0  dropped:0  overruns:0  carrier:0
          collisions:0 txqueuelen:1000
          RX bytes:7095 (6.9 Kb)  TX bytes:1418 (1.3 Kb)
          Interrupt:10 Base address:0xa000

lo        Link encap:Local Loopback
          inet addr:127.0.0.1  Mask:255.0.0.0
          inet6 addr: ::1/128 Scope:Host
          UP LOOPBACK RUNNING  MTU:16436  Metric:1
          RX packets:51  errors:0  dropped:0  overruns:0  frame:0
          TX packets:51  errors:0  dropped:0  overruns:0  carrier:0
          collisions:0 txqueuelen:0
          RX bytes:3379 (3.2 Kb)  TX bytes:3379 (3.2 Kb)

root@pepcok:~#

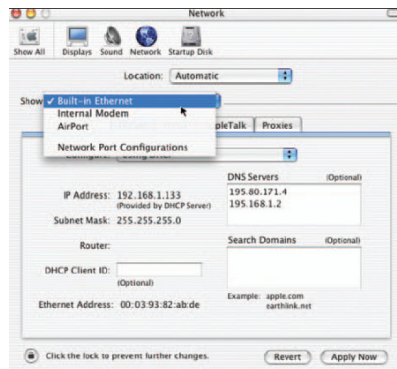
```

## 5.1.5 Setting up a static IP in Mac OS

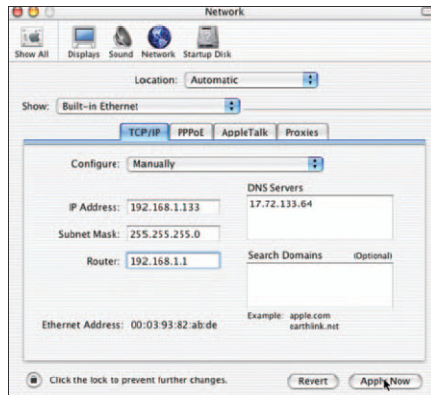
1. Open the **Network** Control Panel in **System Preferences**.



2. Select **Built-in Ethernet** from the pop-up menu.



- Set the **IP address** manually in the format 10.10.1.X (e.g. 10.10.1.200) and **Subnet Mask** 255.255.0.0.



- Click on **Apply Now** and close the **Network** panel, saving your settings.

## 5.2 Improving network performance

The latency of a PLC network is higher than that of an Ethernet network. Most operating systems have a default setting of the network latency based on Ethernet figures. To obtain the maximum performance using TCP traffic (FTP download, for example) the operating system has to be tuned to the new network conditions. For improving the network performance, we provide scripts for Windows and Linux operating systems. The scripts can be found on the enclosed CD, in the folder **scripts**. The scripts will set the TCP window size to 512 kB.

With a Windows PC, simply double-click on the file **tcpwin.reg**, provided on the documentation CD in the „scripts“ folder. You can also run the script using the autorun feature of the CD.

```
Windows Registry Editor Version 5.00
[HKEY_LOCAL_MACHINE\SYSTEM\CurrentControlSet\Services\Tcpip\Parameters]
"TcpWindowSize"=dword:00080000
"GlobalMaxTcpWindowSize"=dword:00080000
"Tcp1323opts"=dword:00000003
```

tcpwin.reg for use with Windows operating systems

With a Linux PC running kernel 2.4 or higher, open the console and execute the command `./tcpwin.sh 512` logged in as `root`.

```
##!/bin/sh
#
# Corinex TCP Window Size Tweak
#
if [ "$#" -eq 0 ]
then
    echo "Usage: $0 <window size in KB>"
    exit
fi
WIND=`expr $1 \* 1024`
echo $WIND > /proc/sys/net/core/rmem_default
echo 8388608 > /proc/sys/net/core/rmem_max
echo $WIND > /proc/sys/net/core/wmem_default
echo 8388608 > /proc/sys/net/core/wmem_max
echo 4096 $WIND 8388608 > /proc/sys/net/ipv4/tcp_rmem
echo 4096 $WIND 8388608 > /proc/sys/net/ipv4/tcp_wmem
```

tcpwin.sh for use with Linux operating systems

After applying the script, please reboot the system. This applies for both Windows and Linux.

### 5.3 Checking Network Performance

On the **Main** page, under the heading **Available PLC Connections**, there is a list of the MAC addresses of all of the neighboring adapters that have a connection with that adapter. The list also indicates the physical throughput (actual data rate), in terms of both transmission and reception, that the adapter is achieving with each adapter on the network.

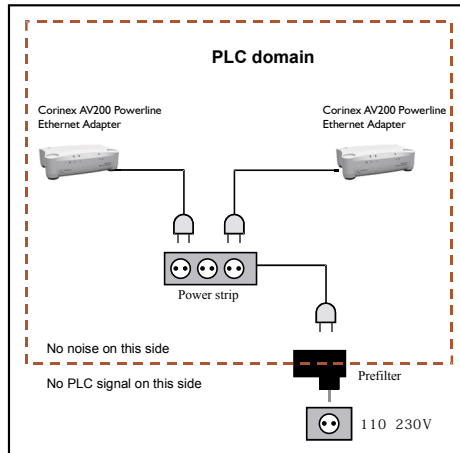
Available PLC Connections				
PLC Port	MAC Address	Phy Tx Throughput	Phy Rx Throughput	Bridge State
10	0050C22CF6B8	116 Mbps	114 Mbps	Forwarding
9	0050C22CF6C6	112 Mbps	110 Mbps	Forwarding

### 5.4 Using PLC Filters

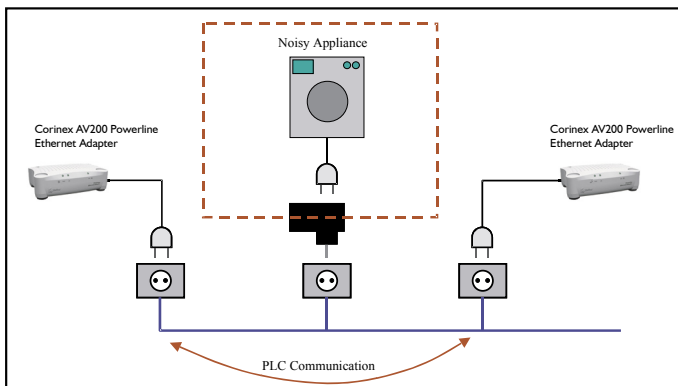
A PLC (Powerline) filter is a low-pass filter that will only allow the 50/60 Hz main voltage through. This filter blocks the Powerline signal.

When to use this filter:

- When you want to isolate a Powerline test network from the rest of the electrical grid, either because you don't want the Powerline signal from the test network to go out and disrupt other adapters, or because you want to isolate this network from the noise, or other traffic, in the rest of the electrical grid. This setup is illustrated in the picture below.



- When you want to isolate the electrical noise produced by some household appliance, because this noise falls in the PLC band and disrupts the signal from the adapters. This setup is illustrated in the picture below.



## 6 Troubleshooting Guide

The *Corinex AV200 Powerline Adapter* has been designed to be a reliable and easy-to-use network connection device. Please refer to the list below to aid in troubleshooting.

### **The POWER LED is off.**

1. Verify the connection of the power cable to the adapter's power inlet.
2. Make sure the power adapter is properly plugged directly into the electrical outlet, and that the outlet has power.
3. Try another outlet.

### **The Powerline Act LED is off.**

1. Make sure the adapter is plugged directly into the outlet, rather than into a surge suppressor or power strip. The current model of the Powerline AV 200 Adapter is not designed to function through a surge suppressor.

### **The Ethernet LED is off.**

1. Make sure the adapter is connected with an Ethernet enabled device with an RJ-45 cable and both devices are powered.

If the trouble persists, please visit [www.corinex.com](http://www.corinex.com) and go to the appropriate section for information on your product. There you will find news, manuals and software updates, as well as frequently asked questions (FAQ).

### **To avoid personal injury and damage to the system:**

1. The principal method to disconnect the device completely from the electrical power network (mains) is to unplug the power cord from the mains socket.
2. Never install the unit in wet areas or next to radiators/heaters.
3. Never use the unit outside.
4. Unplug the unit during severe storms.
5. Never open the equipment enclosure.

If you can't solve your problems using the information sources mentioned above, please send us the problem description via <http://www.corinex.com/web/com.nsf/Doc>. We would like you to give us all possible information about your devices and your network, when contacting us. This includes:

- Types of devices you have, if possible with serial numbers (printed on the safety labels)
- Which of these devices are working incorrectly or don't work at all (indicate the problems)
- If it's possible, send us a scheme of your network topology also with the IP addresses for computers/router/access point, this can speed up the problem estimation. If you use any non-Corinex equipment, please specify what kind. The drawing can be made in any graphics editor, exported to one of the standard graphic formats (JPEG, GIF). Or you can just draw it on paper and scan it
- Specify operating systems used with the devices
- Please send us the firmware version and configuration of these devices. Please see the user guide for detailed instructions on this.